

The reptile fauna of Nombinnie Nature Reserve and State Conservation Area, western New South Wales

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ABSTRACT

Nombinnie Nature Reserve and State Conservation Area form a large reserve system of 116,000 hectares in central western New South Wales. Systematic surveys for reptile fauna in 2003 revealed 204 individuals from 33 species from within five different vegetation communities. A review of literature from previous research in the area combined with this study reveal a total of 50 species of reptile fauna. The presence of two reptile species that are listed under the *NSW Threatened Species Conservation Act, 1995* is discussed. This study provides an updated inventory of reptile fauna for the largest area of continuous mallee shrubland remaining in NSW and identifies key differences in reptile diversity within vegetation communities.

Key words: lizard, snake, threatened species, Nombinnie, western NSW.

Introduction

Australia supports an extremely diverse range of reptiles with a plethora of information available to scientists and natural resource managers documenting species distribution (Cogger 2000; Wilson and Swan 2003). However, in western NSW, we are continuing to gain an understanding of the reptile fauna of the arid and semi arid rangelands with a review documenting species status (Sadler and Pressey 1994) and a field guide documenting locations of museum specimens (Swan *et al.* 2004). More specifically, information collected on the distribution of reptiles in the study area has focussed predominantly on mallee vegetation communities (Cogger 1984; Caughley 1985; Henle 1987; Halliger 1993; Schlesinger *et al.* 1997; Driscoll 2004; Olsson *et al.* 2005).

Nombinnie Nature Reserve (NR) and State Conservation Area (SCA) were gazetted in 1988 and 2005 respectively under the *National Parks and Wildlife Act, 1974* and are managed by the Department of Environment and Conservation (DEC). These reserves are located on the boundaries of the Cobar Peneplain and Darling Depression Bioregions of central western New South Wales (NSW) (NPWS 2000). The two reserves are considered large enough to withstand stochastic events such as drought and fire, with Nombinnie NR being 70,000 hectares and Nombinnie SCA 46,000 hectares (NPWS 2003; DEC 2005). The reserves are of high conservation significance as they contain the largest continuous stand of mallee remaining in NSW (NPWS 2003). Yathong and Round Hill Nature Reserves, which form part of this continuous stand of mallee, are situated on the western and eastern boundaries, respectively. This reserve system is also known to contain populations of threatened species and provides examples of other vegetation communities that are vulnerable in the Western Division of NSW such as Belah and Bimble box (NPWS 2003). If natural resource managers are to manage a large reserve system, it is an important

component to develop a comprehensive inventory of the reptile fauna and to gain an understanding how reptile communities are distributed across different vegetation communities.

This paper reports on a reptile survey in Nombinnie NR and SCA and highlights differences between reptile diversity and a number of vegetation communities. In addition, this paper summarises previous reptile studies in the area.

Methods

Study Area

Nombinnie NR and SCA are located in central western NSW, 130km south of Cobar and 200km north of Griffith (Figure 1). The area is characterised by level to gently undulating plains of siliceous and sandy red earths. The dominant vegetation communities are mallee shrublands (93,290 hectares, *Eucalyptus socialis*, *E.dumosa* with many areas of

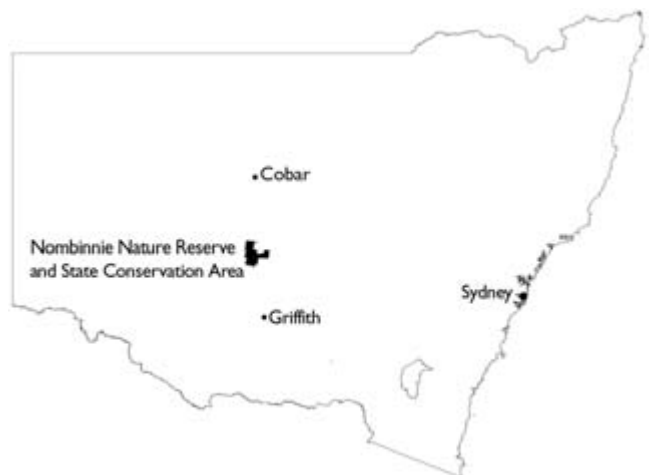


Figure 1. Nombinnie NR and SCA are located in central western New South Wales.

Spinifex grass, *Triodia scariosa*), grassland and scattered trees (12,300 hectares, *Austrostipa* sp. and *Eucalyptus intertexta*), Bimble Box/Pine woodland (1,820 hectares, *Eucalyptus populnea* spp. Bimbili– *Callitris glaucophylla*), Broombush (4,360 hectares, *Melaleuca uncinata*) and Belah/Wilga/Box woodland (4,230 hectares, *Casuarina cristata*, *Geijera parviflora*, *E.intertexta*) (NPWS 2003).

Survey methods

Surveys were conducted between September and December 2003. Although the SCA had not yet been gazetted, it was being managed by DEC under the management protocols of a SCA, and as such, is treated as managed land for the purpose of this paper. The location of the survey sites was stratified by vegetation community. Surveys were based around a 2ha (100m x 200m) quadrat within each of the five different vegetation types. An additional site was sampled in the mallee due to the large expanse of this vegetation community across the reserves (giving a total of 6 sites – MAL1, MAL2, GRS1, BIM1, BRM1, BEL1) (Table 1). Reptiles were surveyed using the hand searching technique (Blomberg and Shine 1996) with each of the six sites having a search effort of 20 person hours, giving a total search effort of 120 person hours. Hand searches were conducted between 0700 and 2200 eastern standard summer time at temperatures between 15–43°C to cover a wide range of conditions. Reptiles were located by walking randomly across the quadrat and searching through different microhabitats known to be inhabited by reptiles (Blomberg and Shine 1996). Microhabitat searches included raking through leaf litter and other ground debris, lifting and dividing clumps of spinifex grass, lifting logs, rocks and anthropogenic debris such as corrugated iron, viewing hollow logs and tree crevices.

Nomenclature in this paper follows Swan, Shea and Sadlier (2004).

Results

Systematic surveys recorded a total of 204 individuals from 33 species of reptiles during this study (Table 2). In this study, Mallee shrubland had the highest number of reptiles with 18 species, whilst 15 species of reptile were in Bimble box-pine woodland.

Nineteen species of reptile appeared to show some vegetation specificity being found within only one vegetation community. Examples of these include Smooth Knob-tailed Gecko *Nephrurus levis* (mallee), Western Blue tongue lizard *Tiliqua occipitalis* (mallee), Marble-headed Snake-lizard *Delma australis* (mallee), Eastern Stone Gecko *Diplodactylus vittatus* (mallee) and Thick-tailed Gecko *Underwoodisaurus milii* (grassland). Conversely, Beaked Gecko *Rynchoedura ornata* and Shingleback Lizard *Tiliqua rugosa* could be regarded as habitat generalists, being recorded in all vegetation types.

Previous studies in the area

A review of scientific literature found a number of previous studies of reptile fauna in Nombinnie and the adjoining reserves of Yathong and Round Hill (Cogger 1984; Caughley 1985; Henle 1987; Schlesinger *et al.* 1997; Driscoll 2004; Olsson *et al.* 2005). As Yathong and Round Hill NR's share adjacent boundaries, form part of the largest area of continuous mallee in NSW with Nombinnie and the all reserves are managed as a single landscape system (NPWS 1995; Hugh McNee, DEC, pers.com), it is expected that reptile fauna in these reserves are also likely to be found at Nombinnie. A summary of previous studies and this study are presented revealing a total of 50 species of reptile fauna for the area (Table 3).

Discussion

An important part of natural resource management is improving our understanding of biodiversity in managed lands. Reptile fauna is one of the most poorly studied

Table 1. Coordinates of sampling locations within Nombinnie Nature Reserve and State Conservation Area. (UTM, AGD66).

Sampling ID	Easting	Northing	Brief Site Description
BRM1	410138	6346571	Broombush community dominated by <i>Melaleuca uncinata</i> . Bare ground with sparse herbage. No fallen timber present
GRS1	389259	6371363	Open grassland community with scattered <i>Eucalyptus intertexta</i> . Minor amounts of fallen timber around trees. Scattered rocks also present.
MAL1	375048	6363906	Mallee shrubland community dominated by <i>Eucalyptus socialis</i> and <i>E. dumosa</i> . Severe wildfire recently burnt 7,000 hectares of reserve. Sparse herbage appearing after recent rain, Mostly bare ground, but Spinifex starting to regenerate (but less than 150mm tall, less than 15% cover).
MAL2	382534	6330538	Mallee shrubland community dominated by <i>E.socialis</i> and <i>E.dumosa</i> . Approx. 18 years since last fire. Mature Spinifex grass very common, around 300mm tall and 60% cover.
BIM1	393762	6329011	Bimble box/pine community dominated by <i>E.populnea</i> and <i>Callitris glaucophylla</i> . Large, mature eucalyptus with many hollows. Lots of fallen timber and leaf litter. Diverse ground covers and grasses. Numerous amounts of corrugated iron and other metal scrap.
BEL1	382365	6347021	Belah community intermixed with Wilga and Red Box. Large quantities of fallen timber, diverse ground cover, loose bark common, ground cover sparse in the community.

Table 2. Reptile species and number of individuals observed within each vegetation community at Nombinnie NR and SCA. MAL= Mallee shrubland, BIM= Bimble box-pine woodland, BEL= Belah woodland, BRM= Broombush, GRS= Grassland with scattered trees.

Scientific name	Common name	MAL1	MAL2	BIM	BEL	BRM	GRS
REPTILIA							
Gekkonidae							
<i>Diplodactylus damaeus</i>	Beaded gecko		2				1
<i>Diplodactylus steindachneri</i>	Box-patterned gecko		1				
<i>Diplodactylus vittatus</i>	Eastern stone gecko		3				
<i>Gehyra variegata</i>	Common dtella				6		
<i>Heteronotia binoei</i>	Prickly gecko			6	3		3
<i>Nephurus levis</i>	Smooth knob-tailed gecko		1				
<i>Rhynchoedura ornata</i>	Beaked gecko	3	1	6	3	2	7
<i>Strophurus intermedius</i>	Southern spiny-tailed gecko		1	2	2		
<i>Underwoodisaurus milii</i>	Thick-tailed gecko						6
Pygopodidae							
<i>Delma australis</i>	Marble-headed snake-lizard		1				
<i>Delma butleri</i>	Spinifex snake-lizard		2				
Varanidae							
<i>Varanus gouldii</i>	Sand Goanna		2	1		1	2
<i>Varanus varius</i>	Lace Monitor		1	2			
Agamidae							
<i>Amphibolurus nobbi coggeri</i>	Nobbi dragon			3			
<i>Ctenophorus fordii</i>	Mallee dragon		10			1	
<i>Ctenophorus pictus</i>	Painted dragon		3			4	
<i>Pogona vitticeps</i>	Central bearded dragon			2	3	1	
Scincidae							
<i>Cryptoblepharus carnabyi</i>				8	6		
<i>Ctenotus allotropis</i>				2			1
<i>Ctenotus atlas</i>			4				
<i>Ctenotus robustus</i>	Robust ctenotus			2		1	3
<i>Ctenotus schomburgkii</i>			6	1		2	
<i>Egernia inornata</i>	Desert skink	2	1			1	
<i>Egernia striolata</i>	Tree skink				11		
<i>Lerista muelleri</i>	Three-toed lerista						2
<i>Menetia greyii</i>							5
<i>Morethia boulengeri</i>	Boulenger's morethia			12			
<i>Tiliqua occipitalis</i>	Western Blue-tongue		1				
<i>Tiliqua rugosa</i>	Shingleback lizard	2	1	8	7	2	6
<i>Tiliqua scincoides</i>	Eastern Blue-tongue			2			
Elapidae							
<i>Pseudechis australis</i>	Mulga snake		1				1
<i>Pseudonaja textilis</i>	Eastern brown snake						1
<i>Suta dywieri</i>	Dywers black-headed snake			1			2
	Total individuals	7	42	58	41	15	40
	Total species	3	18	15	8	9	13

taxa of vertebrate across the vast majority of Australian ecosystems when compared with birds and mammals (Mac Nally and Brown 2001). The paucity of knowledge on reptile distribution across Australia is reflected in a number of published range extensions in recent times (Fearn 1998; Gaikhurst 2002; Sass *et al.* 2005).

This study provides additional information to natural resource managers on the distribution of reptiles in Nombinnie NR and SCA with a total of 33 species of reptile being recorded (Table 2). In addition, a review of previous studies increases the total number of reptile species for the area to 50 (Table 3). Three species had

Table 3. Reptiles recorded at Nombinnie NR & SCA, Yathong NR and Round Hill NR, based on this study (SAS), Cogger (COG) (1984), Caughley (CAU) (1986), Henle (HEN) (1987), Schlesinger et al (SCH) (1997), Driscoll (DRI) (2004) and Olsson et al (OLS) (2005). R= Recorded.

Scientific name	Common name	SAS	COG	CAU	HEN	SCH	DRI	OLS
REPTILIA								
<i>Gekkonidae</i>								
<i>Diplodactylus byrnei</i>	Gibber gecko		R					
<i>Diplodactylus damaeus</i>	Beaded gecko	R	R	R	R	R		R
<i>Diplodactylus steindachneri</i>	Box-patterned gecko	R						R
<i>Diplodactylus vittatus</i>	Eastern stone gecko	R	R	R		R		
<i>Gehyra dubia</i>	Dubious dtella							R
<i>Gehyra variegata</i>	Common dtella	R			R			R
<i>Heteronotia binoei</i>	Prickly gecko	R						R
<i>Nephurus levis</i>	Smooth knob-tailed gecko	R			R			R
<i>Rhynchoedura ornata</i>	Beaked gecko	R	R	R	R	R	R	R
<i>Strophurus intermedius</i>	Southern spiny-tailed gecko	R	R	R		R	R	R
<i>Underwoodisaurus milii</i>	Thick-tailed gecko	R	R	R				R
<i>Pygopodidae</i>								
<i>Delma australis</i>	Marble-headed snake-lizard	R						
<i>Delma inornata</i>	Plain snake-lizard		R					
<i>Delma butleri</i>	Spinifex snake-lizard	R						R
<i>Lialis burtonis</i>	Burtons legless lizard		R			R		
<i>Pygopus lepidopodus</i>	Common scaly-foot		R			R		
<i>Pygopus schraderi</i>			R					
<i>Varanidae</i>								
<i>Varanus gouldii</i>	Sand Goanna	R	R		R		R	R
<i>Varanus varius</i>	Lace Monitor	R	R		R			R
<i>Agamidae</i>								
<i>Amphibolurus nobbi coggeri</i>	Nobbi dragon	R	R	R		R	R	
<i>Ctenophorus fordii</i>	Mallee dragon	R		R	R	R		R
<i>Ctenophorus pictus</i>	Painted dragon	R	R	R	R	R		R
<i>Pogona vitticeps</i>	Central bearded dragon	R	R	R	R	R	R	R
<i>Scincidae</i>								
<i>Cryptoblepharus carnabyi</i>		R	R	R	R			R
<i>Ctenotus allotropis</i>		R	R	R			R	R
<i>Ctenotus atlas</i>		R	R	R	R	R		R
<i>Ctenotus regius</i>	Royal ctenotus				R	R		
<i>Ctenotus robustus</i>	Robust ctenotus	R	R	R	R	R		
<i>Ctenotus schomburgkii</i>		R	R	R	R	R	R	R
<i>Egernia inornata</i>	Desert skink	R	R		R	R		R
<i>Egernia striolata</i>	Tree skink	R	R		R			
<i>Eremiascincus richardsonii</i>	Broad banded sand-swimmer				R			
<i>Lerista muelleri</i>	Three-toed lerista	R	R		R		R	R
<i>Lerista punctovittata</i>	Spotted lerista		R	R	R	R	R	R
<i>Menetia greyii</i>		R	R	R	R			
<i>Morethia boulengeri</i>	Boulenger's morethia	R	R		R			R
<i>Morethia obscura</i>	Dull morethia		R	R			R	
<i>Tiliqua occipitalis</i>	Western Blue-tongue	R	R					
<i>Tiliqua rugosa</i>	Shingleback lizard	R	R		R			
<i>Tiliqua scincoides</i>	Eastern Blue-tongue	R	R					

<i>Typhlopidae</i>								
<i>Ramphotyphlops australis</i>	Southern blind snake	R	R					
<i>Ramphotyphlops bituberculatus</i>	Prong-snouted blind snake	R	R			R		
<i>Elapidae</i>								
<i>Brachyurops australis</i>	Australian coral snake	R	R			R	R	
<i>Pseudechis australis</i>	Mulga snake	R						
<i>Pseudonaja nuchalis</i>	Western brown snake	R			R	R		
<i>Pseudonaja textilis</i>	Eastern brown snake	R						
<i>Suta dyweri</i>	Dywers black-headed snake	R	R	R				
<i>Suta nigriceps</i>	Short-tailed snake							R
<i>Suta suta</i>	Curl snake						R	
<i>Vermicella annulata</i>	Bandy bandy	R						
NO. OF SPECIES		33	36	21	23	20	12	23

not been recorded in the previous studies (Marble-headed Snake-lizard, Eastern Brown Snake *Pseudonaja textilis*, Mulga Snake *Pseudechis australis*). The larger species are more likely to be found during active hand searches rather than being captured using conventional methods such as pitfall traps. The records for these three species highlights the importance of using a method other than pitfall trapping (Blomberg and Shine 1996; Swan and Foster 2005). It is likely that by using only random transects and hand searches and not other methods such as pitfall trapping, species such as blind snakes and sand-swimmers could have been missed, demonstrating a limitation to this study.

Eighteen species of reptile were recorded in mallee, representing the highest species diversity of the vegetation types sampled. Further, eight species of reptile were found only in mallee and no other vegetation community. This habitat specificity has been previously recorded for species such as the Western Blue Tongue Lizard and Marble-headed Snake Lizard (Swan *et al.* 2004), and *Ctenotus atlas* (Henle 1987), however, other species such as the Box-patterned Gecko *Diplodactylus steindachneri*, have been found throughout a variety of semi-arid habitats (Swan *et al.* 2004; Swan and Foster 2005). This result may be a reflection of the limited number of search hours during this study and it is likely that this species may inhabit other vegetation communities.

Mallee supported the highest number of habitat specialists. Many species of reptile are also known to rely on the dense, protective spines of spinifex grass to provide refuge, feeding and breeding areas (Cogger 1969; Fyfe 1980; Caughley 1985; Sadler and Shea 1989). The results of this study clearly suggest that areas of mallee with spinifex grass support a greater diversity and abundance of reptiles compared to areas of mallee without spinifex grass.

Only seven individuals from three species (Shingleback Lizard, Beaked Gecko and Desert Skink) were recorded at the MAL1 site. This site had a scarcity of spinifex grass and other habitat attributes such as fallen timber because of a large wildfire (>7,000 hectares) in 2002 (NPWS 2003). The presence of the Shingleback Lizard is probably explained by a flush of fresh herbage that forms a

major component of its diet. Both the Beaked Gecko and Desert Skink form a major part of reptile communities in a post-fire mallee environment (Caughley 1985, Sass and Wilson, unpubl. data) This may be due to their ability to use burrows and soil cracks (Swan *et al.* 2004) (pers.obs.), which may lead to an increased chance of survival both during a fire event and from predators in a post-fire environment.

Bimble box-pine woodland also had high reptile species diversity with 15 species recorded. Previous studies in this vegetation community have also yielded high diversity (Wassens *et al.* 2005). As with the mallee, some species of reptiles were only recorded in Bimble box-pine. These included the Eastern Blue tongue Lizard *Tiliqua scincoides*, Boulenger's Skink *Morethia boulengeri* and Nobbi Dragon *Amphibolurus nobbi coggeri*. The Eastern Blue tongue lizard has long been considered to be an opportunist, having become quite common in metropolitan areas across Australia (Koenig *et al.* 2001). However, during this study at Nombinnie, it would appear that this species is rarely found in other vegetation communities.

Within the Belah woodlands eight species of reptile were recorded. Two species of reptile appeared restricted to this vegetation community. Both Common Dtella *Gehyra variegata* and Tree Skink *Egernia striolata* were found only in Belah woodlands. Tree Skinks have shown similar habitat specificity elsewhere (Sass *et al.* 2004). Almost 25% of all individuals observed in Belah comprised Tree Skinks suggesting that this species is prolific within these woodlands.

Eight species were also recorded in Broombush, however, the abundance of reptiles was significantly lower with only 15 individuals observed. This vegetation community provides little habitat heterogeneity with important microhabitat features such as fallen timber, hollow logs, leaf litter and fallen and loose bark, absent. Further, no species of reptile appeared restricted to this vegetation community.

Thirteen species of reptile fauna were found in the grassland communities of Nombinnie. Four species of reptile were only recorded at the grassland site (Eastern Brown Snake, Thick-tailed Gecko, Three-toed *Lerista Lerista muelleri* and *Menetia greyii*). The numerous

scattered trees throughout the grasslands provide important habitat components for reptiles, such as fallen timber and loose bark.

Two species recorded during this study, the Western Blue tongue Lizard and the Marble-headed Snake Lizard, are listed under the *NSW Threatened Species Conservation Act, 1995*. The Western Blue Tongue Lizard is listed as Vulnerable while the Marble-headed Snake-lizard is listed as Endangered. Both species were found at only one mallee site (MAL2). The Western Blue Tongue Lizard has been opportunistically recorded in Yathong NR (G. Swan, pers.com), Round Hill NR (Cogger 1984), Nombinnie NR in 2005 (C. Coombes, CSU, pers.com), and nearby at Matakana in 2000 (D. Egan, DEC, pers.com). The observations of Swan, Egan and Coombes were made in mallee with a spinifex understorey, however, Cogger found this species in areas of mallee without spinifex. The sighting by Coombes in 2005 was in close proximity to the MAL1 site (< 1km), which was also regenerating from the 2002 fire. The spinifex grass cover was quite short (<150mm) and sparse (15% cover) (pers.obs), however, vast areas of

unburnt mature spinifex were located within 50 m. Thus the mix of records from mallee with and without spinifex grass understorey indicates that further study of this threatened species is necessary to refine its habitat requirements and develop conservation strategies.

This study has shown that although there are a number of common reptile species found across a variety of vegetation communities at Nombinnie, there are also a number of habitat specialists. Mallee with an understorey of spinifex grass provides high value habitat for a number of reptile species, including two threatened reptile species. The records for the Western Blue Tongue Lizard and Marble-headed Snake-Lizard, both of which are listed under the *NSW Threatened Species Conservation Act, 1995*, are significant. The study has presented additional information for natural resource managers on the reptile diversity across a variety of vegetation communities found throughout western NSW. Nombinnie NR and SCA host a high diversity of reptiles and the reserves should be considered of high value in terms of regional conservation.

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APPENDIX I



MAL2 site with mature spinifex understorey amongst *Eucalyptus socialis* and *E. dumosa*.

Photo: S. Sass



Desert Skink, *Egernia inornata*.

Photo: S. Sass

APPENDIX I



Prickly Geckos, *Heteronotia binoei*, were more common around bumble box/ pine woodland.

Photo: S. Sass



Central Bearded Dragon, *Pogona vitticeps*.

Photo: S. Sass



Beaked Geckos, *Rhynchoedura ornata*, were common across all vegetation communities.

Photo: S. Sass